What is claimed is:

1. An actuator control system, comprising:

an actuator responsive to an actuator control signal to control actuator position;

means for determining actuator current used by the actuator; and

a control circuit responsive to the actuator current exceeding a maximum actuator current value to modify the actuator control signal in a manner that limits the actuator current to a current value near a minimum current required to sustain the actuator position near a desired position.

2. The system of claim 1 wherein the control circuit includes:

friction avoidance logic configured to produce an offset value, the offset value being a function of the actuator control signal if the actuator current exceeds the maximum actuator current value and otherwise being a constant offset value; and

a controller responsive to a difference between an actuator position error value and the offset value to modify the actuator control signal such that the actuator current is limited to a current value near a minimum current required to sustain the actuator position near the desired actuator position by minimizing a difference between the actuator position error value and the offset value.

3. The system of claim 2 wherein the friction avoidance logic is configured to produce the offset value as an offset gain value if a delayed value of the actuator control signal is greater than zero and to otherwise produce the offset value as a negative of the offset gain value, if the actuator current exceeds the maximum actuator current value.

4. The system of claim 2 further including:

an actuator position sensor producing a position signal indicative of the actuator position relative to a reference position; and

actuator position error logic configured to produce the actuator position error value as a difference between a desired position of the actuator and the position signal.

5. The system of claim 4 wherein the controller includes:

proportional logic producing a proportional value that is proportional to the actuator position error value;

derivative logic producing a derivative value that is a derivative of the actuator position error value;

integral logic producing an integral value that is an integral of the difference between the actuator position error value and the offset value, the integral logic including an integrator operable to minimize the difference between the actuator position error value and the offset value; and

summation logic producing the actuator control signal as a sum of the proportional value, the derivative value and the integral value, the actuator control signal resulting in the actuator current being limited to the current value near the minimum current required to sustain the actuator position near the desired actuator position when the integrator minimizes the difference between the actuator position error value and the offset value.

6. The system of claim 1 further including an actuator position sensor producing a position signal indicative of the actuator position relative to a reference position;

wherein the means for determining actuator current comprises actuator current estimation logic configured to estimate the actuator current as a function of the actuator control signal, a supply voltage value, an actuator direction value indicative of actuator movement direction, the position signal and an actuator temperature value indicative of actuator operating temperature.

7. The system of claim 6 further including:

an engine cooling system coupled to the actuator such that the actuator operating temperature is near that of coolant fluid circulating through the engine cooling system; and

a temperature sensor producing a temperature signal indicative of coolant fluid temperature;

wherein the means for determining actuator current further comprises actuator temperature estimation logic configured to estimate the actuator temperature value as a function of the actuator current and the temperature signal.

8. The system of claim 1 wherein the actuator includes an electric motor coupled to a valve such that the electric motor controls a position of the valve relative to a reference valve position.

9. The system of claim 8 wherein the valve is disposed in-line with an exhaust gas recirculation conduit coupled between an intake manifold and an exhaust manifold of an internal combustion engine;

and wherein the control circuit is configured to adjust the position of the valve to control the flow of recirculated exhaust gas from the exhaust manifold to the intake manifold.

10. An actuator control system, comprising:

an actuator responsive to an actuator control signal to control actuator position;

a position sensor producing a position signal indicative of the actuator position;

means for determining actuator current used by the actuator;

means responsive to the actuator current exceeding a maximum actuator current value to produce an offset value as a function of the actuator control signal;

means for determining an error value as a difference between a desired actuator position and the position signal; and

means for modifying the actuator control signal to limit the actuator current to a current value near a minimum current required to sustain the actuator position near the desired actuator position by minimizing a difference between the error value and the offset value.

11. The system of claim 10 wherein the means responsive to the actuator current exceeding a maximum actuator current value to produce an offset value as a function of the actuator control signal includes means for producing the offset value as a function of the actuator control signal if the actuator current exceeds the maximum actuator current value and otherwise being a constant offset value.

12. The system of claim 11 wherein the means for producing the offset value as a function of the actuator control signal if the actuator current exceeds the maximum actuator current value includes means for producing the offset value as an offset gain value if a delayed value of the actuator control signal is greater than zero, and to otherwise produce the offset value as a negative of the offset gain value.

13. The system of claim 10 wherein the means for modifying the actuator control signal includes:

proportional logic producing a proportional value that is proportional to the actuator position error value;

derivative logic producing a derivative value that is a derivative of the actuator position error value;

integral logic producing an integral value that is an integral of the difference between the actuator position error value and the offset value, the integral logic including an integrator operable to minimize the difference between the actuator position error value and the offset value; and

summation logic producing the actuator control signal as a sum of the proportional value, the derivative value and the integral value, the actuator control signal resulting in the actuator current being limited to the current value near the minimum current required to sustain the actuator position near the desired actuator position when the integrator minimizes the difference between the actuator position error value and the offset value.

14. The system of claim 10 wherein the means for determining actuator current comprises actuator current estimation logic configured to estimate the actuator

current as a function of the actuator control signal, a supply voltage value, an actuator direction value indicative of actuator movement direction, the position signal and an actuator temperature value indicative of actuator operating temperature.

15. The system of claim 14 further including:

an engine cooling system coupled to the actuator such that the actuator operating temperature is near that of coolant fluid circulating through the engine cooling system; and

a temperature sensor producing a temperature signal indicative of coolant fluid temperature;

wherein the means for determining actuator current further comprises actuator temperature estimation logic configured to estimate the actuator temperature value as a function of the actuator current and the temperature signal.

16. The system of claim 10 wherein the actuator includes an electric motor coupled to a valve such that the electric motor controls a position of the valve relative to a reference valve position.

17. The system of claim 16 wherein the valve is disposed in-line with an exhaust gas recirculation conduit coupled between an intake manifold and an exhaust manifold of an internal combustion engine;

and wherein the control circuit is configured to adjust the position of the valve to control the flow of recirculated exhaust gas from the exhaust manifold to the intake manifold.

18. A method of controlling an actuator configured to control actuator position, the method comprising:

determining actuator current used by the actuator; and

controlling the actuator current toward a minimum value of current required to sustain the actuator position near a desired actuator position.

19. The method of claim 18 wherein the actuator is responsive to an actuator control signal to control the actuator position;

and wherein the act of controlling the actuator current includes:

determining an error value as a difference between a desired actuator position and an actual actuator position;

determining an offset value as a function of the actuator control signal if the actuator current exceeds a maximum actuator current value; and

modifying the actuator control signal to limit the actuator current to a current value near a minimum current required to sustain the actuator position near the desired actuator position by minimizing a difference between the error value and the offset value.

20. The method of claim 19 wherein the act of determining actuator current includes estimating the actuator current as a function of the actuator control signal, a supply voltage value, an actuator direction value indicative of actuator movement direction, the actual actuator position and an actuator temperature value indicative of actuator operating temperature.